D 301 81-34/6

Combat Crew

Strategic Air Command

June 1984

UNIV. OF FLA. LIB ★ DOCUMENTS DEPT.★ U.S. DEPOSITORY
JUN 18 1984

THE R's ARE COMING Page 4

Combat Crew

GEN BENNIE L. DAVIS
COMMANDER IN CHIEF, SAC

BRIG GEN JACK K. FARRIS
INSPECTOR GENERAL

COL CHARLES J. WINGERT
DIRECTOR OF SAFETY

STAFF

EDITOR
MAJ. RANDY LAUTERBACH

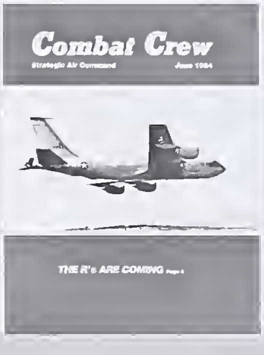
ASSOCIATE EDITOR
KEN MAASSEN

ART EDITOR
W.A. KIRKPATRICK

EDITORIAL ASSISTANT
M. J. ABBOUD

IN THIS ISSUE

Here Come the R's 4
CFIC 8
Are You Prepared for an IFE? 10
SIFC Crosscheck 12
A Herculean Task 14
Cutting Edge 20



ON OUR COVER

2 July 84 — SAC accepts the first KC-135R.

SACRP 127-1 VOL. XXXIV NO. 6 JUNE 1984

COMBAT CREW is an internal publication of the Strategic Air Command with the primary purpose of promoting safety. The contents of this magazine are informative and not to be considered as directive in nature. Facts, testimony and conclusions of all mishaps printed herein may not be construed as incrimination under Article 31 of the Uniform Code of Military Justice. All names, dates and places used in conjunction with mishap stories are fictitious. Written permission must be obtained from Headquarters, Strategic Air Command, before any material may be reprinted by other than U.S. Air Force organizations. Use of funds for printing this publication has been approved by Hq. USAF. Distribution FX, controlled by IGFC SAC units submit distribution requests through local PDO. Reader to copy ratio 9:1. For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Contributions are encouraged as well as comments and criticism. Direct correspondence with the Editor is authorized. Address correspondence to Editor, Combat Crew, HQ SAC/IGFE Offutt AFB, NE 68113. AV 271-2620.

The U-2/TR-1

In a previous Combat Crew article I had the opportunity to share with you my thoughts regarding the professionalism of SAC's crew force. In this article I wish to acquaint you with one of SAC's most challenging missions in terms of professionalism and airmanship. I am referring to the U-2 and TR-1. Documented professionalism is a prerequisite for assignment to this highly selective crew force. First, let me give you a brief overview of the U-2 and TR-1 organizations, including a few words regarding the aircraft's history; then discuss why the aircraft and mission demand nothing less than total professionalism; and finally, offer a few reasons why those who want challenge, adventure, and a sense of accomplishment should consider applying for these programs.

The original U-2 was conceived by Lockheed's Kelly Johnson in 1955 to meet a national requirement for reconnaissance of the Soviet Union. It first gained notoriety as a result of the 1960 Francis Gary Powers incident. Although much of its history remains cloaked in secrecy, the U-2 has, without interruption, continued to provide our nation with critical intelligence. In 1968, a larger, more capable version of the U-2 was built. The latest version of the U-2, called the TR-1, is now rolling off the production line.

Today two SAC wings operate these aircraft, the 9th Strategic Reconnaissance Wing at Beale AFB and the recently activated 17th Reconnaissance Wing at RAF Alconbury. The 9 SRW has two squadrons: the 99th Strategic Reconnaissance Squadron which provides U-2 pilots and mission planners for worldwide strategic reconnaissance operations, and the 4029th Strategic Reconnaissance Training Squadron which conducts all initial and requalification training for the U-2, TR-1, and SR-71. The 95th Reconnaissance Squadron at RAF Alconbury operates the TR-1 to provide peacetime as well as wartime tactical reconnaissance support to NATO.

Regardless of name, U-2 or TR-1, both aircraft are essentially identical, requiring the utmost in pilot skill, judgment, and self-discipline. There are numerous reasons why this is so. The airplane, while a joy to fly, is unlike any other aircraft in the Air Force inventory.

A Professional's Opportunity

Because it was designed specifically to minimize weight and maximize altitude, the U-2 has several unique features. Its extraordinary high thrust to weight ratio provides a breathtaking climb capability. An unusual gear arrangement makes landing rollouts similar to riding a bicycle. Add to that a 104 foot wing span, plus a large vertical stabilizer sensitive to crosswinds and you have all the necessary ingredients to ensure that each flight will be challenging, if not downright exciting. The landings are especially challenging — demanding the utmost in pilot skill.

SAC routinely flies U-2 and TR-1 reconnaissance missions in politically sensitive environments. Since mistakes in these areas can easily turn into international incidents, we are understandably careful to allow only the most capable and mature individuals to fly these missions. When unexpected situations arise (as they occasionally do) the pilot must be ready to handle it without assistance. He must be fully capable of making all the decisions and taking all the actions necessary to resolve any aircraft emergency. On operational missions there is usually neither the time nor capability for the pilot to discuss and resolve a problem with the command post and of course, he carries no additional crew on board to help. We obviously cannot afford to entrust such responsibility to someone who does not have the self-discipline to gain a complete understanding of his responsibilities and to achieve perfection in the execution of his mission. Dedication and stamina are prerequisites, for the missions are long, routinely exceeding ten hours, and are always flown in a full pressure suit. Fortunately, there are many individuals in the Air Force, and especially in SAC, who possess these qualifications.

Clearly the world of the TR-1 and U-2 is exciting and rewarding and, contrary to what many individuals believe, it is available to almost all B-52 and -135 pilots. For those who love a challenge, I would encourage them to investigate this program for it offers many benefits. First, it is an excellent opportunity for career broadening within the operations field. SAC reconnaissance is a major contributor to the national intelligence community and it offers valuable learning experiences unattainable elsewhere. Second, it is challenging duty which generates tremendous self-satisfaction. Crews are able to see in quantifiable terms their daily contributions to national security. Third, due to the dynamic nature of reconnaissance, there are unusual travel opportunities as well as an unlimited variety of operational missions ranging from aerial photography to air sampling and rescue. Finally, there is that sense of pride experienced when an individual becomes a member of a unique organization where esprit de corps is among the highest in the Air Force.

SAC has built an enviable reputation of providing reliable, timely intelligence with the U-2. We've done this by employing professionals, aggressive officers who clearly must be classified as pacesetters for the Air Force. With the introduction of the TR-1, the program is growing and once again a unique opportunity is opening for aspiring SAC crewmembers. So if you consider yourself one of SAC's finest, have a touch of wanderlust in your veins, and want to expand your horizons, perhaps you need to get in touch with the people in the 9th Strategic Reconnaissance Wing.★★

Maj Gen John A. Brashear
HQ SAC DCS/Operations

HERE COME THE R's...

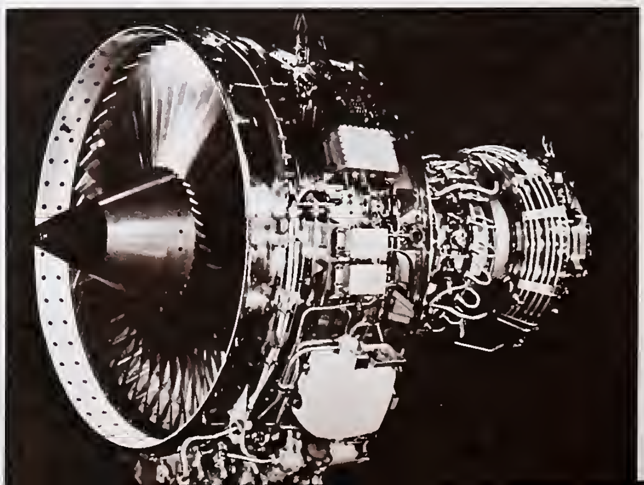
Maj George Kotti
HQ SAC XPHV

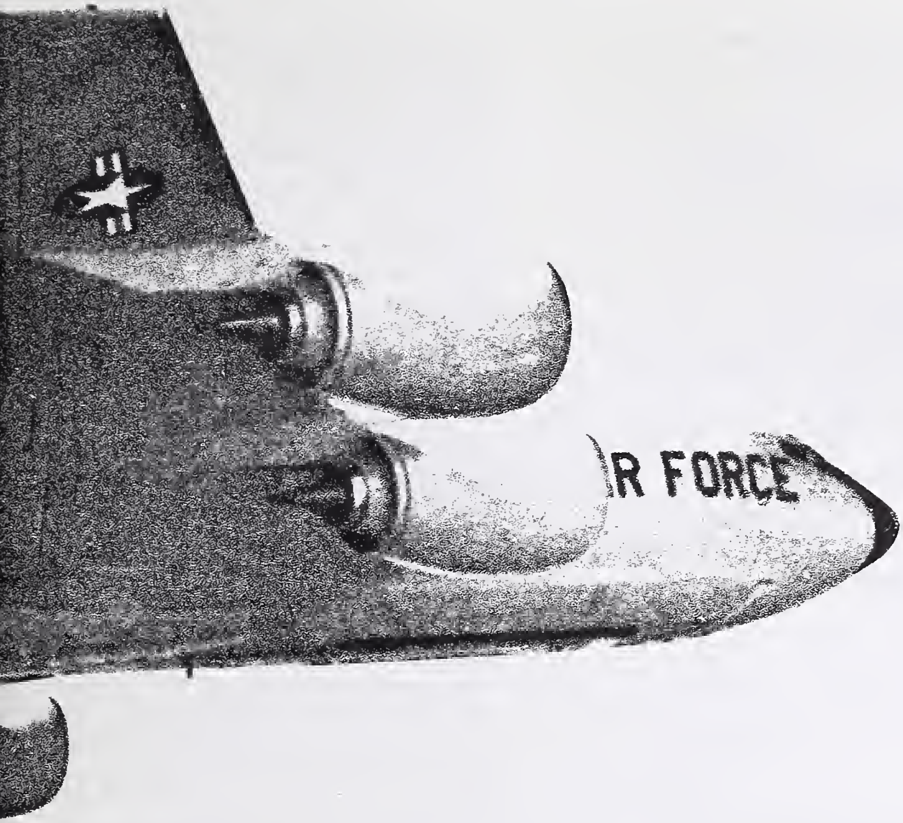
On 2 July 1984, Gen Bennie L. Davis, SAC Commander in Chief, will accept delivery of the first CFM-56 reengined KC-135R aircraft. This event will usher in a new era for the KC-135, which has served SAC and the nation for more than 25 years. However, the recent increase in refuelable aircraft requires additional air refueling support to meet critical military commitments worldwide. The KC-135R Modernization Program offers the "old tanker" another 20 years of "new life" with significantly improved overall capability. Several aircraft systems have been improved with state of the art equipment resulting in a KC-135R that offers better performance, greater fuel efficiency, improved handling characteristics, increased reliability and better maintainability.

The tanker serves as the "hub of air power." Air refueling multiplies existing air capabilities by providing greater force flexibility and increased force utility. Since 1960 the number of receiver aircraft has increased over 600 percent while the actual number of tankers has decreased by 25 percent. The increase in the number of receivers coupled with increasing worldwide defense commitments has led to a serious tanker shortfall. Even with the procurement of 60 KC-10 tankers, the tanker shortfall is expected to remain

Rollout ceremonies at the Boeing Military Airplane Company, Wichita, Kansas, were held on 22 June 1982.

KC-135R modification centers around the high bypass CFM-56 (F-108-CF-100) turbofan engine.





with us throughout the decade and into the 1990s.

Adding increased life to the KC-135 is the purpose of the wing reskin program. In fact, the average structural life of a reskinned KC-135 extends well past the year 2010. This "new life" coupled with increased air refueling requirements makes KC-135 modernization an attractive alternative. A modernized KC-135 fleet improves capability, reduces operating costs and provides a cost effective solution to meeting the air refueling shortfall. The Air Force plans to reengine all KC-135A's with a programmed completion date of FY 93.

The KC-135R is more than just a reengined aircraft. Over 34 aircraft systems or subsystems have been replaced or modified. Let's look at some of the major changes.

The modification centers around the CFM-56-2B1 engine. This high bypass turbofan engine produces 22,000 pounds of thrust and has seen nearly 500,000 hours of commercial service on reengined DC-8 aircraft. This commercial service has been a benefit because those problems normally associated with the development of a new engine will have been solved by the time SAC receives the first KC-135R.

Along with new engines, the KC-135R will have new state of the art integrated drive generators. These generators come on line automatically once the engines are started and also feature a built-in test capability to assist maintenance actions.

The KC-135R landing gear has been modified to increase the maximum gross weight capability to 322,500 pounds. The added gross weight capability allows the KC-135R to carry 203,300 pounds of fuel or fill existing tanks to full capacity. New five rotor brakes and a Mark III antiskid system have been added to improve stopping capability. This new brake system was put through its paces at Edwards AFB during Developmental Test and Evaluation (DT&E) and the results were excellent — a 206,000 pound KC-135R stopped within 4900 feet on a wet runway.

Rudder nose wheel steering is another welcome modification. This modification allows the pilot to apply up to eight degrees of nosewheel deflection with the rudder pedals. The steering tiller remains and will override rudder pedal steering to allow sharper turns when necessary.

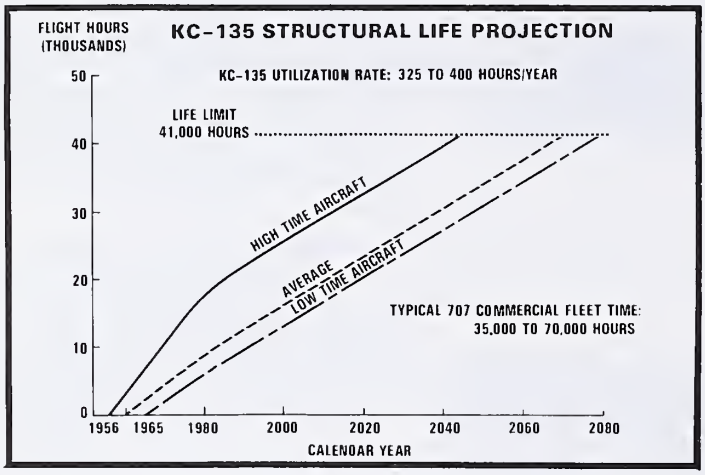
A problem associated with the additional thrust created by the new engines is the loss of directional control resulting from the loss of an outboard engine during takeoff. To solve this problem, the KC-135R has a Engine Failure Assit System (EFAS) that automatically senses differential fan RPM. When the fan differential exceeds 500 RPM, the EFAS begins to command a compensating rudder deflection that varies depending on airspeed. The EFAS was tested

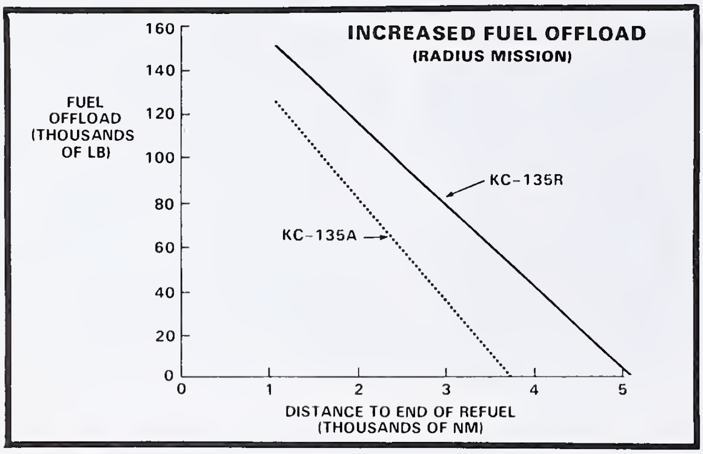
The distinctive new silhouette of the reengined KC-135R.

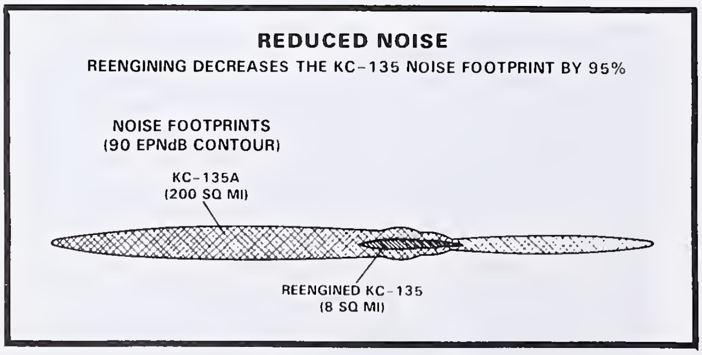
A reengined KC-135R refuels a C-5 transport.

KC-135R MODERNIZATION BENEFITS

- KC-135R WILL PROVIDE
  - —50% INCREASE IN FUEL OFFLOAD CAPABILITY
  - —25% REDUCTION IN FUEL CONSUMPTION
  - —95% REDUCTION IN NOISE LEVEL
  - —76% REDUCTION IN SMOKE EMISSION
  - —66% REDUCTION IN GASEOUS EMISSION
  - —20% REDUCTION IN TAKEOFF DISTANCE
- OVERALL
  - —50% INCREASE IN TANKER FORCE CAPABILITY






REDUCED NOISE
REENGINING DECREASES THE KC-135 NOISE FOOTPRINT BY 95%
NOISE FOOTPRINTS (90 EPNdB CONTOUR)
KC-135A (200 SQ MI)
REENGINED KC-135 (8 SQ MI)

extensively during DT&E and its performance was outstanding in all situations making it a welcome added safety feature for the KC-135R.

Another important modification is the full time series yaw damper. The yaw damper provides a noticeable improvement in controlling the "dutch-roll" tendency of the KC-135A. Test pilots have rated the KC-135R handling characteristics as "excellent, a significant improvement over the KC-135A."

The modified tanker also contains a dual Auxiliary Power Unit (APU) system that provides on board starting capability, electrical power and air for the Environmental Control System (ECS). Yes, that means no more cartridge starts for the KC-135R. Operating in an EWO start mode, the APU system provides sufficient bleed air to start two engines simultaneously. Results from recent tests indicate that four engine alert start times for the KC-135R under normal conditions will be slightly more than a minute.

Another valuable modification to the KC-135R is the Turbine Engine Monitor System (TEMS). The TEMS supports SAC's engine conditioning monitoring program by providing valuable data. The TEMS airborne equipment will collect data pertinent to engine parts life, engine warranty validation, engine performance trending, overspeed/overtemp information and more, making life easier for both the crew and maintenance personnel.

These and other modifications make the KC-135R a total tanker modernization program. Obviously such an extensive program bears much fruit in terms of benefit to SAC.

The increased thrust of the CFM-56 engines provides a significant improvement in takeoff performance. A 322,500 pound KC-135R can take off in less than 8500 feet with a critical field length of less than 11,000 feet (sea level, 90°F). This improved performance increases the number of CONUS and NATO airfields that can be used by the modified tanker.

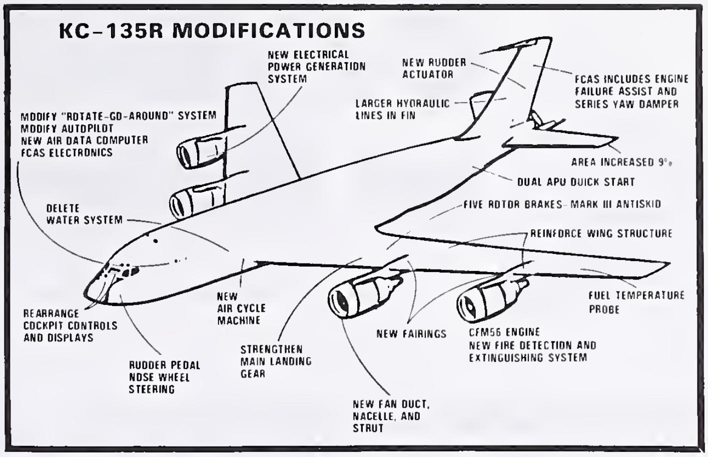
The KC-135R is also a friend to the environment. The aircraft meets current FAA requirements for both visible smoke pollution and noise. The KC-135R produces 92 percent less smoke pollution when compared to a KC-135A during a wet takeoff. In the area of noise, the KC-135R noise footprint (90 EPNdB contour) is 95 percent less than the KC-135A. These impressive improvements to the KC-135R will serve to stabilize community relations and avoid environmental constraints worldwide.

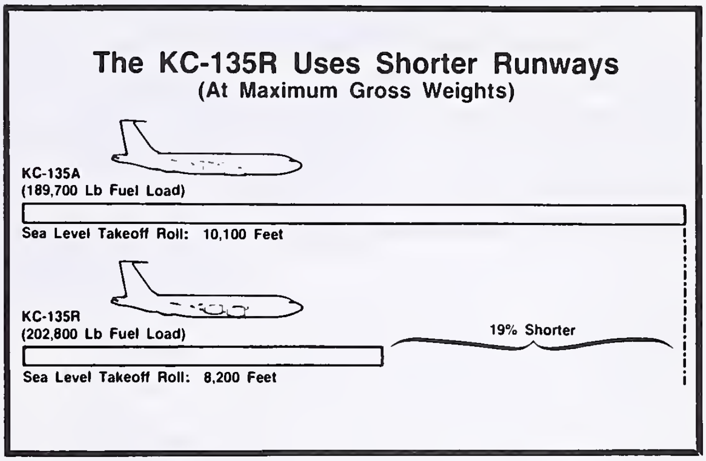
Another benefit to SAC is sharply reduced operating costs. The CFM-56 engine provides a 27 percent improvement in fuel economy alone. Increased fuel efficiency coupled with easier maintainability result in substantial operations and maintenance cost savings.

Although the previously mentioned benefits are important, the real reason for the KC-135R is spelled "increased capability." The increased fuel load and improved fuel efficiency allow this new tanker to offload 50 percent more fuel than a KC-135A on a standard Emergency War Order mission. In fact, on longer missions the KC-135R's improvement climbs to over 100 percent. To put it another way, with a fleet of 600 KC-135Rs SAC would have the refueling capability of over 900 KC-135As. That's impressive. This added capability is absolutely essential at a time when air refueling capability is at a premium.

So, 2 July 1984 will indeed mark the beginning of a new era for the KC-135. Aircraft 61-0293 will report for duty with the 384 AREFW at McConnell AFB. The aircraft has been put through a demanding, rigorous, developmental and operational test and evaluation schedule that included over 560 flight hours and a two month stay in temperatures down to minus 60°F at the Air Force Climatic Laboratory, Eglin AFB. As with all good test programs some minor problems have been identified but they are being solved. The bottom line is that the KC-135R works well and will last a long time.

Past experience has confirmed, time and again, tankers are essential to the success of modern air power. The tanker serves as a "force multiplier," allowing the nation to meet defense commitments, worldwide, in a matter of hours rather than in terms of days or weeks. We've taken a good old airplane, made it better and we've done it for a fraction of the cost it would take to develop a new tanker. The KC-135R is truly a cost effective solution to a serious tanker shortfall.


KC-135R MODIFICATIONS
NEW ELECTRICAL POWER GENERATION SYSTEM
NEW RUDDER ACTUATOR
FCAS INCLUDES ENGINE FAILURE ASSIST AND SERIES YAW DAMPER
LARGER HYDRAULIC LINES IN FIN
MODIFY "ROTATE-GO-AROUND" SYSTEM
MODIFY AUTOPILOT
NEW AIR DATA COMPUTER
FCAS ELECTRONICS
AREA INCREASED 9%
DUAL APU QUICK START
DELETE WATER SYSTEM
FIVE ROTOR BRAKES- MARK III ANTISKID
REINFORCE WING STRUCTURE
FUEL TEMPERATURE PROBE
NEW AIR CYCLE MACHINE
REARRANGE COCKPIT CONTROLS AND DISPLAYS
NEW FAIRINGS
CFM56 ENGINE
NEW FIRE DETECTION AND EXTINGUISHING SYSTEM
STRENGTHEN MAIN LANDING GEAR
RUDDER PEDAL NOSE WHEEL STEERING
NEW FAN DUCT, NACELLE, AND STRUT


The KC-135R Uses Shorter Runways
(At Maximum Gross Weights)

KC-135A/R PERFORMANCE

	KC-135A	KC-135R
ENGINE	J57	CFM56-2B
STATIC TAKEOFF THRUST (LB)	12,925 WET 11,700 DRY	22,000
LENGTH (IN)	138.6	89.8
INLET FAN DIAMETER (IN)	36.8	68.3
AIRPLANE CONFIGURATION COMPARISON		
OPERATING WEIGHT—EMPTY (LB)	105,700	119,200
FUEL CAPACITY (LB)	189,300	203,300
TAXI WEIGHT (LB)	301,600	322,500
NOISE (EPNdB)	124.0	97.1
STRUCTURAL CHANGES SUMMARY		
NACELLES	KC-135A	NEW
PYLONS	KC-135A	NEW
HORIZONTAL STABILIZER	KC-135A	NEW C-135B
MAIN GEAR	KC-135A	NEW
CRITICAL FIELD LENGTH (FT—S.L. 90°F)	13,600	11,000
TAKEOFF DISTANCE (FT—S.L. 90°F)	11,200	9,000
FUEL OFFLOAD (THOUSANDS OF LB)		
1,000 NM RADIUS	120	151
2,000 NM RADIUS	75	114
3,000 NM RADIUS	30	77
3,000 NM—1,000 NM RETURN	67	103

C.P.T. - Challenge or Headache

by Maj John M. Stancil

"Hey Copilot, we got a *?!X# sim tomorrow at 0800." I remember those words from my first AC more than a dozen years ago. I also remember those words coming from me more than nine years ago. If I listen closely around the squadron, I can hear those words today. Why do pilots dislike (mild, I admit) the CPT?

It doesn't fly anything like the airplane. True. It was never meant to be a simulator. It is a procedural trainer. A student can be given an emergency on takeoff, and, as long as procedures are correct, whether it flies or it doesn't is irrelevant. Sure it's frustrating. Write it up. People often comment that Castle's CPTs are better than the ones back home. Why the difference? the answer is simple — **cooperation between crews and maintenance.** Give maintenance good feedback and they will provide you good equipment. We write 'em up and they fix 'em. It takes thorough dedication to keep a CPT running and extraordinary effort to make it good.

"It's a waste of time." Often it is. I remember walking in and having the instructor say . . . "Today we'll make an alert start, go through all the bold print, have a few malfunctions, and practice some random holding and unusual attitudes. Any questions?" Yeah. How do I get out of this? To try and accomplish that many tasks in two or even three hours doesn't leave much time for learning. Just about the time your initial reactions to an emergency are over, so is the emergency and on to the next one. Doesn't happen that way for real, does it?

Here are some general rules you may find useful while instructing in the CPT:

● Emphasize success rather than failure. The object of CPT training is manifold, but the primary objective is to practice emergency situations that cannot be safely practiced in-flight. If a student does not become confident with his/her ability to safely recover crew and aircraft, then training is useless. The instructor who emphasizes only mistakes and doesn't allow time for correction of a weak area is not doing his job. If the student only did one thing right, that one thing should be critiqued just as much as any one mistake.

● Emphasize "FLY THE AIRPLANE FIRST". How many accidents have been attributed to distraction on the crew's part? It is imperative that someone concentrate on flying while a malfunction or an emergency is in progress. In the past, I've been guilty of freezing the CPT and letting the pilots drag out the dash one and have a conference over the throttle quadrant. No more. Realism demands that the problem be solved while the plane is flown.

● If at all possible, carry the emergency or systems malfunction to completion without freezing the CPT. Try this. Just after rotation, give an engine failure that takes the associated hydraulic system with it. Let the students run with it all the way to final recovery. You will be surprised how many considerations there are. So it eats up two hours. The crew gets to practice exactly what they would do if it happened for real. They walk out the door with a sense of accomplishment and maybe, just maybe, they won't dread their next CPT.

To be a good CPT instructor, there are four tasks which you must consider:

● Briefing — Effective student practice requires preparation immediately prior to the practice mission. This is the time to review a particular system and/or procedure to be used during the mission, i.e., maneuvers to be practiced, emergency procedures, likely sources of error, appropriate communications procedures, etc. If you really want to get a feel for how much your students know, let them brief a system to you. You won't be bored.

● Performance Monitoring and Diagnosis — During student practice the instructor monitors the student's performance to identify deviations from prescribed performance criteria and, equally important, the instructor must diagnose the cause of each deviation. Proper diagnosis can be very difficult when performance standards are not clearly defined or when practice conditions vary. As instructors, we must treat the cause of an error rather than merely identifying the error.

● Coaching and Guidance — Sometimes the hardest thing for an instructor to do is keep his/her mouth shut and let the students make minor mistakes. Many times I have watched as a new instructor jumps on the first mistake, hits the freeze button, and spends the rest of the period lecturing the students on what they should be doing. In this case the students are bored and learning is virtually nil. It is better for the instructor to sit back and take notes for use during the critique. If the

students are headed toward a major error, i.e., the wrong checklist or procedure, then a few words to get them on the right track may be the best option.

- Critiquing — A critique is what the instructor should do after the mission, but what most instructors do with the freeze button during the mission. It's difficult to learn if we're never allowed to make mistakes. A good critique provides reinforcement even if errors were pointed out during the mission. A good critique also provides the means to correct or avoid errors in-flight as well as during subsequent trainer practice. Also, one thing which instructors frequently forget is that a critique should reinforce the good things as well as correct the bad.

In addition, there are also a few other tasks which a simulator instructor should consider to maximize learning.

First, before the period starts, the trainer must be configured to the requirements of the training situation. Environmental conditions, fuel loads, radio facilities, geographic position, etc., must be set up. Required performance data, operating manuals, approach plates as well as lesson guides must be prepositioned. During the period, the instructor must anticipate the upcoming events and configure the trainer to provide realistic situations. It can be embarrassing when the instructor gets caught behind or actuates the wrong switch. Not only does the instructor lose credibility, but valuable learning and realism may be lost.

Next, the instructor must continually evaluate the ability of the student to meet the lesson objectives. If the student is in over his/her head or if the program is not challenging, then the instructor may choose to modify the training situation to meet the needs of the individual student.

Also, the instructor must fill in on the interphone or radios to simulate ground radio facilities as well as crew chief and crew responses which will assist the crew in properly completing checklist items. The instructor should also simulate UHF radio transmission, i.e., ARTCC, Command Post. This is vitally important to add realism to compound emergency situations. Speaking of realism, is Boxcar 50/Reno 25 always our call sign during emergencies?

Clearly, it is a real challenge to become a good CPT instructor. Until our 1950's CPT is updated or replaced, we, as instructors must strive to provide learning in a realistic environment. It takes a lot of preparation and dedication, but the CPT can be a valuable teaching tool if the instructor accepts the challenge.

ARE YOU PREPARED FOR AN IFE?

Maj William L. T. Truitt
93 AREFS, Castle AFB

Simulators! What a pain in the old aspiration. All that wasted time in **the box** and half the time it didn't work properly. When it was working you had one of those hard-line instructors that gave you multiple emergencies just as fast as he could push the buttons. Besides all the perspiration and headaches it gave you, it was a waste of time because nothing ever happens in a hurry in the tanker — let alone in multiples. Just look around, ask your buddies; how many have had emergencies? Several. Okay, how many have had multiple emergencies? Not many. How about a serious, life threatening one, where you had to act quickly and correctly? None, you say? Well, here's one for you.

It seems like it came right out of one of those "unrealistic, merciless, ego-shattering, sweatbox simulators." It starts innocently enough, no maintenance problems, and for once things are really going smoothly. Of course, that couldn't be true for our receiver, a B-52, and we have to delay for him. Finally, the BUFF is fixed and we start engines. Still no problems.

The taxi-out is normal with the copilot running the checklist — plenty of time to make our new air refueling control time. The supervisor of flying is cleared around to make his "last chance" inspection while the copilot tries to adjust the generators. He just can't seem to get the number two generator to indicate any (KWs) or reactive load (KVARs). So the IP in the jumpseat gives it a try. The "old head" gets it to balance out with the other generators. (No sweat, so what if the reheostat is in the 10:30 position? It's unusual, but the Dash-1 says it's flyable, just write it up in the 781.)

The "Taxi" checklist is completed, the IP and the student copilot change seats for the takeoff — everything's going well. Tower gives clearance to take off, the "Before Takeoff" checklist is completed, good water injection on all four engines, and the generators are holding their own. At 126 knots, "S-1" (looking good) . . . 159 knots, "rotate." That's when it begins — from the back of the crew compartment comes a voice over interphone, "Generator light illuminated." The IP looks up — (Nuts! Number two generator breaker light is illuminated) a quick check of the voltage and frequency (very convenient that the selector switch was on number two) shows zero volts and zero cycles. The IP quickly trips the number two generator control switch. Two lights are now illuminated on the overhead panel, but there's no loss of electrical equipment — number two bus is now powered by the other generators.)

The landing gear and wing flaps were retracted on schedule and the departure radio call made. Departure Control calls traffic at 12 o'clock, three nautical miles, altitude unknown. "Anybody see him?" Then the student boom operator, anxious to get on with his duties, advises that he's turning on the air conditioning. The cockpit quickly fills with smoke (or fog) as Departure Control states, "Traffic at 12 o'clock, two nautical miles, altitude unknown." (Where is that guy?) And now an excited voice over the interphone, "Fire light on number two engine!" Sure enough, there it is glaring defiantly right at us.

The pilot quickly retards number two throttle to idle. "IBO, scan number two engine." All the engine instruments appear normal for an engine at idle — exhaust gas temperature around 300 degrees, fuel flow 1400, oil pressure 45 psi, tachometer at 70 per cent.

"See anything, IBO?"

"No sir — no smoke, no flames."

(What's going on out there?) Just then the fuel flow goes crazy — it bounces from 1000 to 15,000 ppm, and the low oil pressure light starts flickering on and off. The IP rapidly cuts off the throttle and pulls the fire switch. The IBO then reports a "bluish smoke" coming from number two engine. (No doubt now, we have an engine fire.) An emergency is declared and the Engine Fire or Failure During Flight checklist completed.

Now comes the information none of us ever want to hear. "IP — IBO, the fire is burning through the cowling and into the strut." Someone just squeezed a "hair-trigger." (Open, close, dump, pump and however that goes.)

"Crew, we're dumping fuel."

"IP — IBO, it's burning into the wing!" (Oh my God, this sucker's gonna blow up on us!)

"Tell Center we have an engine on fire and we're turning direct to the base and descending for a straight-in landing. (So it's opposite direction to traffic, but it's the quickest way to get this beast on the ground and it is VFR.)

"Pilot, keep the airspeed up." (Maybe we can blow the fire out or at least keep the flames away from the fuel tanks in the wing.)

"IP — Pilot, what about donning parachutes?"

"No, we don't have enough to go around — seven parachutes, eight people." (Then again, why not? At least maybe some of us could get out.)

"Crew — IP, everyone available put on parachutes and helmets."

(That's it pilot, just fly the TACAN back to the base — Whoa! A little too much airspeed.) The IP notices the airspeed indicating 400 knots and pulls up the speed brakes. "Pilot, keep the descent going."

(Now let's see, what do we need to land this bear? Landing data!) Here are my cards for 180,000 pounds speeds, we'll use that and add about 15 knots."

(That should be close to the speeds for 200,000 pounds.)

"Pilot — Nav, altitude!"

(We're passing through 2000 feet.) "1500 should be good, it's pretty flat around here." (Nothing over 300 feet out here. Things on the ground look familiar, but where the devil is the base?)

IP to the pilot, "I have the base at two o'clock about five miles. I have the aircraft." (There's the base — we're way left, doing about 275 knots at 1500 feet and we still have 100,000 pounds of fuel!)

The IP turns the aircraft perpendicular to the runway, but the position is too close, the speed is too fast and the aircraft is too heavy.

"Tower, we'll be making a 360 degree turn out here to line up for landing."

"Pilot, what's it look like on your side?"

"We're too close, maybe a 90-270 would work."

The IP turns the aircraft toward the visual reference point where they usually turn base leg. Over the point he makes a 120 degree turn onto base leg. (Airspeed is 250 knots — better slow it down.) He reduces power, puts the speed brakes down, gear handle down and lowers the flaps to 20 degrees. (Amazing how fast you can move when you need to.)

Now comes the information none of us ever want to hear. "IP — IBO, the fire is burning through the cowling and into the strut."

"Hey, the gear didn't come down!" (Great, just what we needed, zero quantity in the left hydraulic system — and just as we're turning final.)

"Let's crossover! Crossover handle up — UP!"

Clunk, clunk, clunk. (What a sweet sound!)

"Gear down and locked." (But we're still at 200 knots!"

"Flaps to 50." (That should help us slow down. Now just line this beast up on the centerline and we're there.)

One hundred and seventy knots crossing the threshold (it's a pretty flat flare), touchdown at about 160 knots approximately 3500 feet down the runway. The IP pulls up what's left of the speed brakes and quickly applies smooth, positive pressure on the copilot's brakes (no anti-skid). Pop — thump!

"We just blew a tire." (Not unexpected at this weight without anti-skid.) Deceleration is almost normal.

"Crew, prepare to abandon aircraft."

IP — IBO, there'll be two of us going out the left hatch, just blow the alarm bell when you want us to get out."

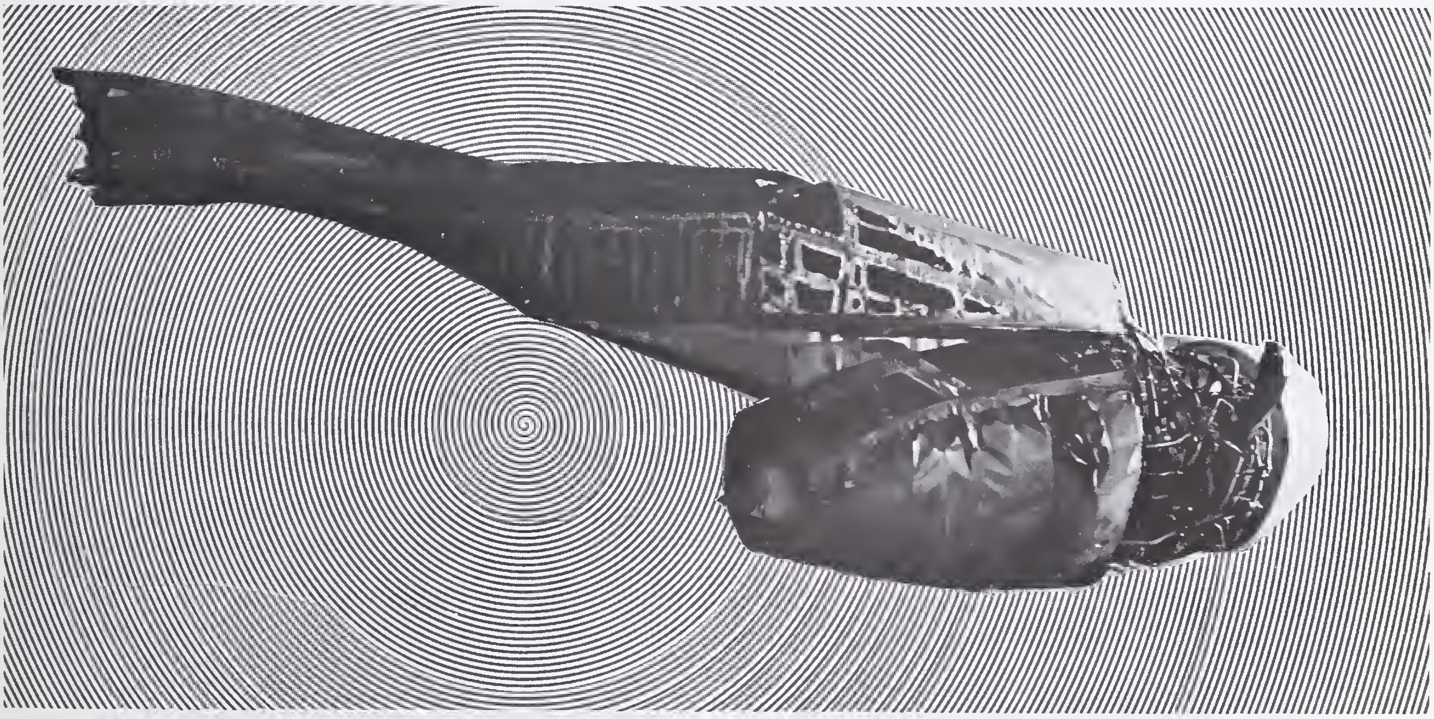
"Wilco."

As the plane rolls to a stop the IP shuts off the remaining three engines and blows the alarm bell. The IBO and extra copilot slide down the escape rope from the aft hatch. The remainder of the crew evacuate down the escape rope through the crew entry chute. (Count heads — six out front and two coming around the right wing, that's everybody.)

"Go! . . . Go! . . . Keep running. Don't stop yet, that sucker can blow any second."

Two fire trucks pass the running crewmembers, quickly followed by two more.

Cont'd on page 24



CROSSCHECK

SIFC

THE SIFC STAFF

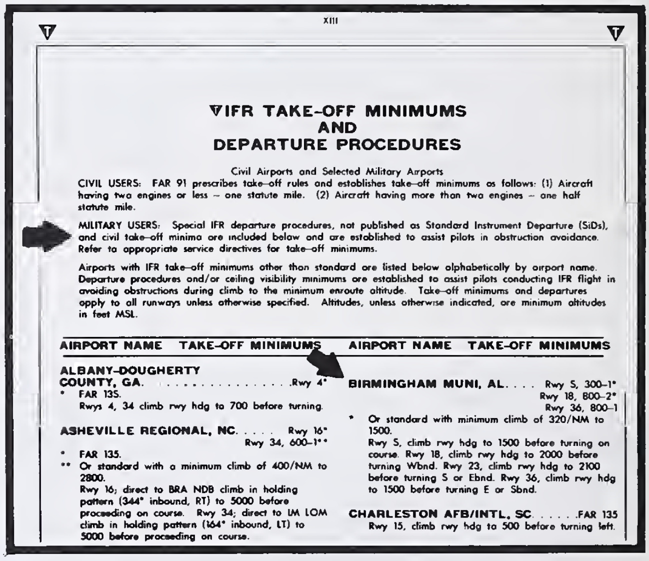
Knowing The Grade

A crew was departing Birmingham Muni, AL, via the Birmingham Two Departure (Eastern SID Book, Fig 1). While awaiting takeoff for RWY 5, the nav asks two questions: "Does this departure have some minimum climb gradient?" and, "What does that Ⓣ *in the Departure Route Description mean?" (These questions should have been covered during mission planning, but all of us have been TDY and know how TDY mission planning gets accomplished!) The pilot searched his gray matter for the answers and then told the nav, "Don't worry about 'em! Civilians use only a 150 FT climb gradient or something. It's less than military gradients anyway. And the "T" only applies to civilian pilots." The copilot nodded in agreement. Everyone on the crew was silent. Then they received takeoff clearance . . .*

We interrupt our story to set the record straight on what the pilot told the nav. First, about civilian and military climb gradients being different — they are not. **All** aircraft (civilian and military) must climb at 200 FT/NM (feet per nautical mile) for departures. The 200 FT/NM requirement took effect in 1979 when the military and FAA agreed on standardized departure criteria. They published this criteria in TERPS (Terminal Instrument Procedures — FAA Handbook 8260.3/AFM 55-9). This criteria establishes an obstacle identification surface (OIS) of 152 FT/NM (Fig 2). What this means to flyers is that by climbing at 200 FT/NM, we are provided 48 FT of clearance above obstacles for each nautical mile along the departure path (48 FT at 1 NM, 96 FT at 2 NM, 144 FT at 3 NM, etc.).

What the Air Force and FAA TERPs experts couldn't agree on was where to **start** the climb gradient. The FAA (so this is applicable at all civil fields) begins the departure climb gradient at the departure end of the runway **35 FT above the departure end elevation** (Fig 2). The Air Force starts the climb gradient computations **at the departure end of the runway elevation.** You should realize that if you're departing a civil field and are not 35 FT in the air at the departure end of the runway, you're already below the safe obstacle clearance altitude the FAA established for the departure. Flying below the obstacle identification surface could ruin your whole day!

The second error the pilot made concerns his misconception about the Ⓣ . You'll find it in the "Departure Route Description" on civil SIDs, and below the "minima block" on Low Altitude IAP books. It indicates there is information **all** pilots need to consider when planning their departure because the field uses nonstandard departure minimums. To know how these nonstandard departure minimums will affect you, you must check the **IFR Takeoff Minimums and Departure Procedures** published in the front of the book you're using. Below is an example of the information you'll find:



XIII

Ⓣ Ⓣ

ⓉIFR TAKE-OFF MINIMUMS
AND
DEPARTURE PROCEDURES

Civil Airports and Selected Military Airports

CIVIL USERS: FAR 91 prescribes take-off rules and establishes take-off minimums as follows: (1) Aircraft having two engines or less – one statute mile. (2) Aircraft having more than two engines – one half statute mile.

MILITARY USERS: Special IFR departure procedures, not published as Standard Instrument Departure (SiDs), and civil take-off minima are included below and are established to assist pilots in obstruction avoidance. Refer to appropriate service directives for take-off minimums.

Airports with IFR take-off minimums other than standard are listed below alphabetically by airport name. Departure procedures and/or ceiling visibility minimums are established to assist pilots conducting IFR flight in avoiding obstructions during climb to the minimum enroute altitude. Take-off minimums and departures apply to all runways unless otherwise specified. Altitudes, unless otherwise indicated, are minimum altitudes in feet MSL.

AIRPORT NAME TAKE-OFF MINIMUMS

ALBANY-DOUGHERTY COUNTY, GA. . . . . .Rwy 4*
* FAR 135.
Rwys 4, 34 climb rwy hdg to 700 before turning.

ASHEVILLE REGIONAL, NC. . . . . . Rwy 16*
Rwy 34, 600-1**
* FAR 135.
** Or standard with a minimum climb of 400/NM to 2800.
Rwy 16; direct to BRA NDB climb in holding pattern (344° inbound, RT) to 5000 before proceeding on course. Rwy 34; direct to LM LOM climb in holding pattern (164° inbound, LT) to 5000 before proceeding on course.

AIRPORT NAME TAKE-OFF MINIMUMS

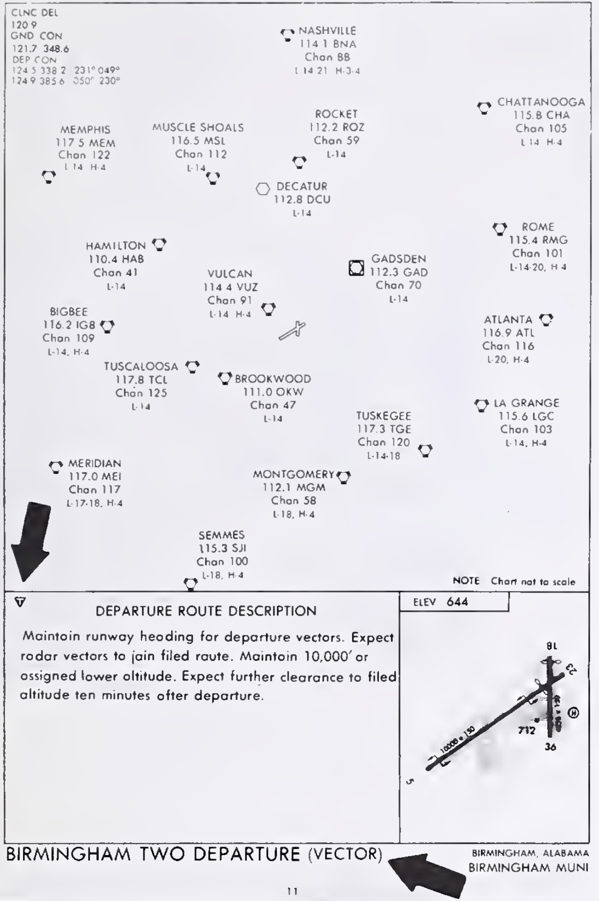
BIRMINGHAM MUNI, AL. . . . . Rwy 5, 300-1*
Rwy 18, 800-2*
Rwy 36, 800-1
* Or standard with minimum climb of 320/NM to 1500.
Rwy 5, climb rwy hdg to 1500 before turning on course. Rwy 18, climb rwy hdg to 2000 before turning Wbnd. Rwy 23, climb rwy hdg to 2100 before turning S or Ebnd. Rwy 36, climb rwy hdg to 1500 before turning E or Sbnd.

CHARLESTON AFB/INTL, SC. . . . . .FAR 135
Rwy 15, climb rwy hdg to 500 before turning left.

Because we are military, we need only concern ourselves with the Military Users part of the IFR Takeoff Minimums and Departure Procedures. And since the crew we are discussing is taking off from Birmingham Muni, we'll use it as an example of how to apply the information.

First, look at the last sentence under Military Users. "Refer to appropriate service directives for takeoff minimums." This means you should use AFR 60-16 criteria to determine if you can take off. The SAC Supplement to AFR 60-16 allows pilots within the command to take off with an RVR of 1600 FT, or 1000 FT for an HHD mission. We can disregard the takeoff minimums for Birmingham Muni (i.e., the 300-1 for Rwy 5) because they are published for civilian **see** (obstacle) — and (therefore) — **avoid** (obstacle) flying. But notice the * next to the weather minimums for Rwy 5.

FIGURE 1.



11

BIRMINGHAM TWO DEPARTURE (VECTOR)

BIRMINGHAM MUNI
BIRMINGHAM, ALABAMA

CLNC DEL
120.9
GND CON
121.7 348.6
DEP CON
124.5 338.2 231° 049°
124.9 385.6 050° 230°

NOTE Chart not to scale

DEPARTURE ROUTE DESCRIPTION

Maintain runway heading for departure vectors. Expect radar vectors to join filed route. Maintain 10,000′ or assigned lower altitude. Expect further clearance to filed altitude ten minutes after departure.

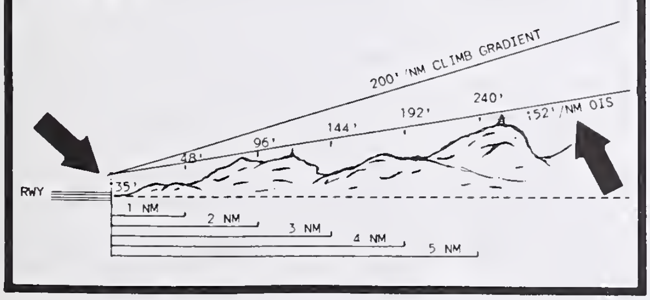
BIRMINGHAM TWO DEPARTURE (VECTOR)

BIRMINGHAM, ALABAMA
BIRMINGHAM MUNI

11

The * provides special information, as the first sentence under **Military Users** states, "Special IFR departure procedures . . . are established to assist pilots in obstruction avoidance." But there are really two parts to "special IFR departure procedures." The first is to alert you that a greater than 200 FT/NM climb gradient is required, as in the case here for Rwys 5 and 18. We must fly a climb gradient of at least 320 FT/NM to 1500 FT to safely overfly obstacles. The second part of the "special IFR departure procedures" are what you can expect to receive when requesting a radar departure. If you take off on Rwy 18, you could expect a clearance like, ". . . maintain runway heading to 2000 FT, then cleared on course. Contact departure on 243.0. Cleared for takeoff."

FIGURE 2.



We intentionally left out the part of the first sentence that reads, ". . . not published as SIDs." We did this because when you fly a SID, you must use the SID's depicted climb gradient and routing in lieu of what's published in the **IFR Takeoff Minimums and Departure Procedures.** The pilot in our story filed the **Birmingham Two Departure** from the SID book, but this is **not** a SID. The word **Vector** next to the name indicates there isn't established routing, only various Navaids the pilot may be vectored to. As flyers, we need to know that when the 🆃 is depicted on a departure or instrument procedure, that this supplemental information must be reviewed before takeoff.

Before we finish the story about the crew departing Birmingham, we want to ensure you understand three important points: 1. Both civil and military departures require a minimum climb gradient of 200 FT/NM, unless a higher gradient is published. They differ only in where the climb gradient begins (35 FT above the departure end for civil departures, **at** the departure end on military departures); 2. Because we use AFR 60-16 (command) criteria to determine takeoff minimums, we must comply with the appropriate published climb gradient. We don't use the see-and-avoid weather minimums established for civilian pilots; 3. The "special IFR departure procedures" can prepare the crew for departure instructions on radar departures.

There are two different endings to this story, you choose the one you like best:

. . . But the pilot didn't feel right. He'd pulled those answers out of thin air. They weren't correct, and the crew's silence confirmed it.

He keyed the mike before the copilot had a chance to acknowledge the takeoff clearance. "We've got a few more checklists to do, we'll need a few more minutes."

"Roger, continue holding short. Advise us when you're ready for departure."

The pilot glanced over at the Co in time to see his relief. "Okay Nav, I owe you one. There's something about that "T" . . .

OR

. . ."Thank goodness," the pilot thought to himself, "this silence is deafening. Takeoff clearance never came at a more opportune time." The aircraft turned onto the runway as three of the tower controllers watched.

"We could use a new air conditioner. On hot days like this that old unit doesn't hack it" one of the controllers was saying as he rearranged his departure slips.

"I'll call downstairs and see if we can borrow the dispatcher's fan," the other said as he reached for the phone.

Both men were startled when the third controller jumped to his feet. They looked at him, then in the direction of his blank stare. The controller with the phone swung around and hit the crash net line. "Off the end of the runway about half a mile, a . . ."

Next month we'll look at how the crew can determine (or should have determined) how they'll make (or should have made) the required climb gradient. Until next month then, fly like your life depends on it.
AUTOVON 347-4571

A Herculean Task

Maj Richard G. Innes
Capt Steven E. Wayne
97 AREFS, Blythville AFB

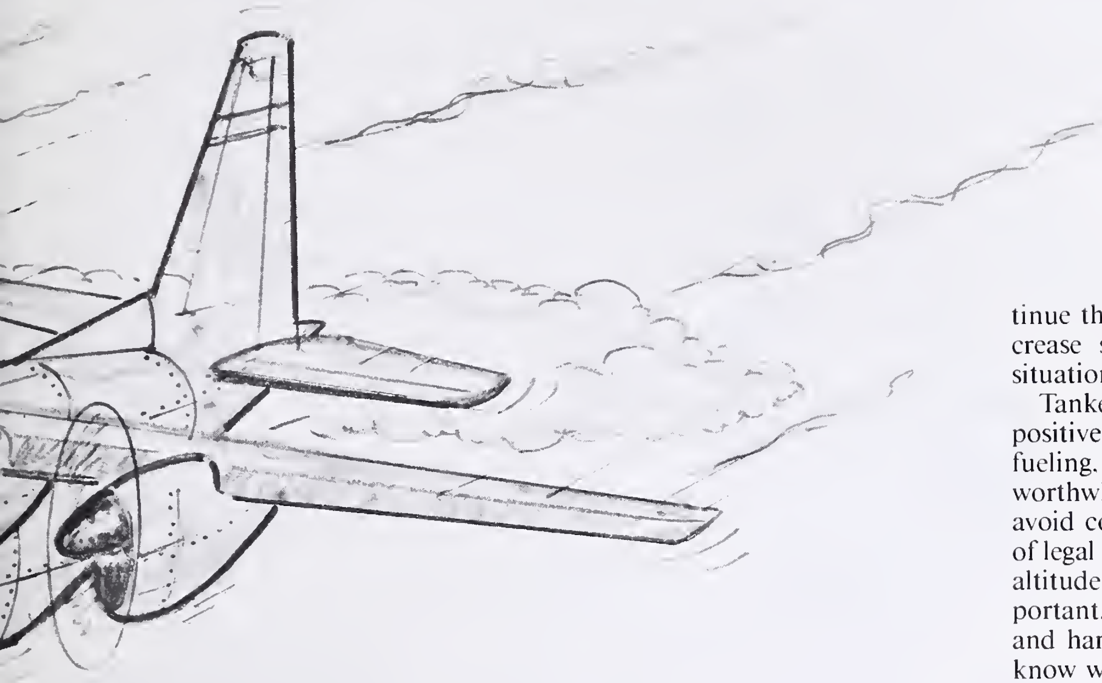
If I were to ask all you Tanker Toads, "What is your favorite rendezvous among our extensive repertoire?" most would reply, "C-130s." Nothing can match the fun of rolling out in perfect trail behind your receiver, flying directly above the receiver, watching the C-130 disappear beneath you, and then waiting for your radio altimeters to verify your precise navigation. But what happens after that is another matter. Completing the rejoin takes some careful flying, and what about the actual AR? Well, guess what, you don't always have to "waller" around the sky vibrating your teeth out because your flaps are down, and you don't often have to suck up 16,000 pounds of fuel each hour either. However, there are some other things to consider that make C-130s a special challenge, so let's take a look at them.

To begin, let's talk configuration for air refueling if tanker gross weight is below 210,000 pounds and the angle of attack stays below 0.6 units. Usually 0.6 units of AOA occurs with flaps up at the 210,000 pound gross weight figure. So for mission planning purposes, if the planned start AR weight is below 210,000 pounds, you can fairly safely assume that flaps up refueling is possible. But is it practical?

To answer that question, take a look at the type of receiver and the scheduled AR altitude. If your receiver is a heavy model, like an MC or AC-130, and the air altitude is up around 12,000 feet, there is a good chance the receiver will require a toboggan to get all his fuel. In this case, you ought to plan a flaps down refueling to get some extra drag so the tanker's engines won't be operating at low RPM in the poor engine acceleration region. On the other hand, if you have a lighter weight receiver (like a straight "C" model) at 13,000 feet MSL, or any type C-130 at 8000 feet or lower, you should be able to do the refueling in level flight, and the flaps up option is a much better way to go for several reasons.

First, you really save gas with the flaps up, about 4000 pounds per hour. In a typical double track training mission, that can mean more than 8000 pounds of fuel you won't use to do exactly the same job.

For mission planning, 1CEVG states that "16,000 pph will remain in the book and represents the conservative approach to mission planning; however, this does not preclude unit schedulers/aircraft commanders from exercising sound judgment in adjusting this planning factor from known shutdown reserves to enhance unit fuel conservation efforts." The 97 AREFS has documented excess fuel reserves and is now using a fuel flow rate planning factor of 12,000 pph for C-130 refueling when we know the refueling will be "flaps up." This may allow you to download 4000 pounds of fuel for every hour of 130 refueling you are



scheduled for. By not carrying the unnecessary 8000 pounds of fuel around for the whole mission (double track), you can save an additional 1000 pounds of JP-4.

Second, your boom operator will probably notice the boom operates more smoothly with the flaps up. This happens because extended flaps deflect turbulent airflow onto the ruddervators, further reducing the controllability of these control surfaces in the very slow airflow required for C-130 refueling. By the way, some C-130 drivers report that their airplane is more stable when the tanker's flaps are up. This is probably due to the combination of smoother air in the C-130s altitude plane and a better performing boom.

Third, you can use autopilot throughout the entire rejoin and refueling without having to turn it off for flap operation. This is one less item to "mess up" during that tricky rendezvous. And the rendezvous completion can be tricky. It takes a lot of mental discipline to keep the speed up to 275 KIAS for 30 seconds after the receiver disappears below the glare shield/off the radar. But get antsy and you wind up in perfect formation right on top of or even behind the receiver. C-130 crews have noted this is a recurring problem. Anything you can do to uncomplicate things, like not having to cycle flaps and autopilot, is going to be helpful. By the way, C-130 types prefer to refuel with the tanker's autopilot engaged, whether or not you use flaps.

There are a few other C-130 specialties worth noting. C-130s can slow down a lot faster than they accelerate, thanks to those four big air movers on the front of the wings. This means that 130 drivers sometimes close to precontact and contact faster than the boom operator likes. As always, boom judgment is the key for tankers. Make sure the 130's closure rate does not exceed boom operator parameters.

The C-130's performance characteristics can also cause problems during a rejoin if the tanker winds up at 200 KIAS directly on top of the receiver. This is actually a tanker under run. In this situation, C-130s can reduce speed only to about 160 to 170 KIAS, and they will then be slow to re-accelerate. So it may take quite a while to get the receiver far enough back in trail to continue the rejoin. You may want to increase speed a bit to help out the situation, if your receiver concurs.

Tankers don't often operate below positive control airspace during air refueling, so a few other comments are worthwhile, too. This is real see and avoid country. There may be all sorts of legal visual flight rule traffic in your altitude block, so clearing is very important. These planes tend to be small and hard to see, and Center may not know where they are.

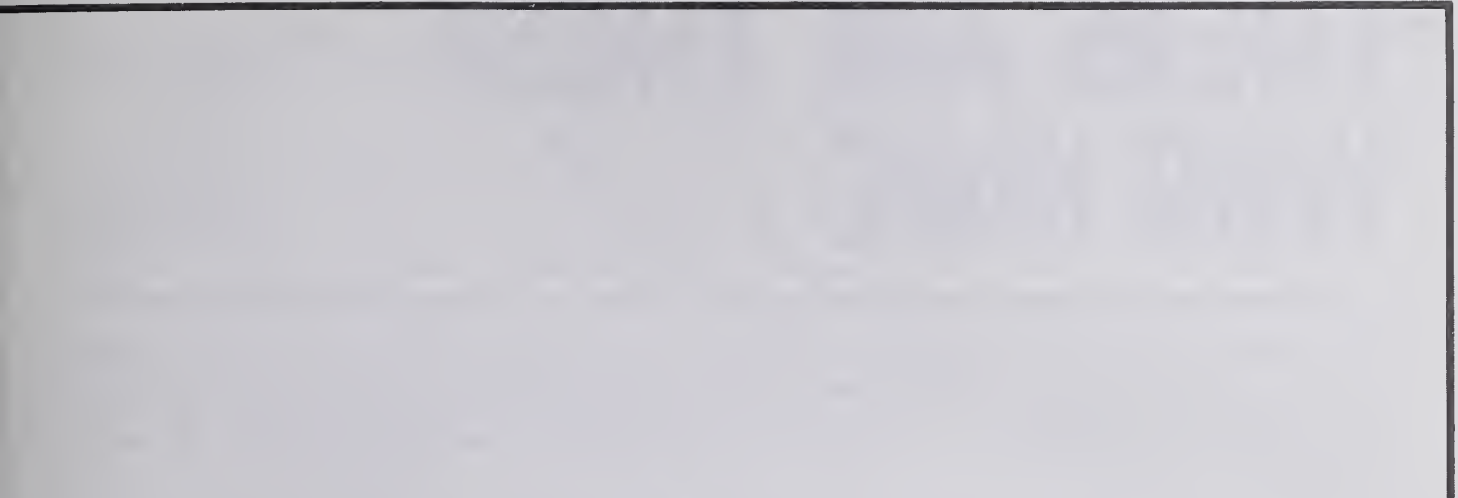
Altimetry is another item of interest. Most C-130 refuelings occur at altitudes using QNH altimeter settings. Your receiver may not approach the rendezvous with the same local altimeter setting you are using. The tanker navigator must be sure all altimeter settings, in both aircraft, are coordinated during the initial contact phase. This goes for comm out rendezous, too. Especially in mountainous areas altimeter settings can change radically in very short distances. Your exciting C-130 rendezvous could easily get a little too exciting.

Altimeter settings may also change during refueling operations. As formation lead, be sure the receiver gets altimeter updates as necessary. You might delay until end of track for a minor altimeter change, but be sure the 130 departs AR with the latest local altimeter setting. If you do need to change a setting during refueling, it would be best to put the receiver back behind precontact, although the C-130 copilot can reach the AC's altimeter cross cockpit.

Well, that's about it. The main items are to strive for flaps up, autopilot on, refueling whenever possible. Keep your head out of the cockpit, and watch out for the altimeter. You'll have a smoother flight, and you may save us taxpayers over $730.00 for each hour of Herkybird refueling.

Why I Like Welders

Lt John Hutsebaut
USS Worden (CG 18)



Drills are nice. Everyone has a good time rushing about fighting pretend fires, floods and other disasters. Still, nothing can get your blood racing and adrenaline pumping at 2 a.m. on a boring midwatch like having to combat a real fire.

You can simulate fires from now till the cows come home, but you can't beat the real things for training your people. It teaches you things that just don't happen during drills. That's why I like welders — they give us lots of chances to practice on the real thing.

I recently spent two years helping to pull a ship through a complex overhaul at a Navy shipyard and believe me, I know. One time my chief walked into Main Control, white-faced, and told me he had just thrown an arc welder out of the plant. He had caught the man striking an arc on the side of a CO_2 bottle! Another time a friend of mine was walking down a busy passageway just outside the log room. He smelled burning paint. A few more steps and he could feel a glowing hot spot waist high on the inboard bulkhead. After posting one of the log room yeomen to warn people, he went around to the compartment's entrance. He found a welder blithely welding a support to the bulkhead and vigilant fire watch peering over his shoulder, ready for all eventualities.

I even got a chance to be a hero. On a pre-watch tour of the No. 2 auxiliary machinery room, I came across a large pile of rags lying on the deck. Dropping into the pile at regular intervals were sparks and welding slag from some work on the mid-level. After putting out the just-starting fire, I told the welders to stop work. Then I explained to the engineering officer of the watch what had happened.

My biggest fire took place one night on the midwatch. An oxyacetylene welder in the No. 2 engineroom somehow managed to cut his own oxygen line with the welding flame. Twelve-foot flames fed by pure oxygen slowly ate their way along the hose while two of my men tried unsuccessfully to beat down the fire with a fixed CO_2 system, and a third tried to cut off the supply of oxygen by crimping the hose. My engineroom supervisor traced the twin hoses for 50 feet looking for a cutoff valve only to have them disappear through a small cut in the hull. Now *that* was an exciting midwatch.

My favorite incident took place one afternoon just as I was leaving the ship. A welder was working on the 01 level of the aft superstructure. A painter had been working in the same area earlier that day and had left a paint roller can with paint still in it. When the welding slag hit the paint can, a cheerful blaze ensued.

The officer of the deck (OOD) was quickly informed of the situation and directed the boatswain's mate of the watch to pass the word. He responded by passing the words he had been practicing every day for a month: "This is a drill; this is a drill. Fire, fire, fi . . ." The startled OOD ripped the phone from his hand and shouted: "This is *not* a drill! Fire! Fire! Fire! Class Bravo fire starboard side aft superstructure. Away the duty repair party."

Now it seemed to me that the thing to do was to hand the welder a CO_2 bottle. Instead, 20 sailors showed up dragging breathing apparatus, fire axes and crowbars. The welder decided to help. He noticed a broom leaning against the bulkhead and began trying to beat out the Class Bravo fire.

Just as the broom started to burn really well, the OOD came charging out of the quarterdeck shack to check on the progress of the firefighters. The welder decided he had better dispose of the flaming broom, so he threw it over the side, narrowly missing the OOD, who turned around and ran back into the quarterdeck shack.

The fun was finally spoiled when one of the repair party members climbed the ladder to the 01 level with a CO_2 bottle and put the fire out. I've seen Laurel and Hardy movies where I didn't laugh as much!

Yes, welders are lots of fun. I think it would be a shame if they all ever become completely safety conscious. Think of all the great training we'll miss!

About the author: Lt. Hutsebaut is damage control assistant aboard USS Worden, a guided missile cruiser. (Reprinted from NAVY LIFELINE)

"THERE ARE THOSE WHO HAVE . . ."

Capt Glenn T. Hanbey
28 ARS, Ellsworth AFB

The following is an account of an incident that happened to me about two years ago. It showed me how easily any of us can get caught up in the subtle events that can lead to an accident . . . It might help someone else from making the same mistakes.

Many people, including aircrew members, are shocked when they hear stories about gear-up landings, aircraft landing at the wrong airfields, airplanes flying along with no one in control because each pilot thinks the other is flying, and a host of other "how could they be so dumb" type incidents. We think that these events are the result of gross misjudgements, huge oversights, or total incompetence. I think that you will find, however, that most of us have been closer to one of these situations than we care to admit. We realize that with the right set of circumstances, even the most experienced aviator can be lured into one of these potentially disastrous situations.

I had my own firsthand encounter with one of these situations as a copilot on a KC-135. My aircraft commander at the time was the same one that I had been flying with for over a year. I felt that he was the best AC in the squadron, and still believe he is the best I have ever flown with. He was also an instructor pilot. We were a very conscientious crew, and prided ourselves on our crew coordination and careful adherence to tech order procedures. With CEVG, two ORI's, a SAC Bombing and Navigation Competition and

many other highly visible and important missions under our belts, we felt that we were one of the best crews in SAC.

On this particular occasion, we were flying out of Andersen AFB Guam. Because of the experience level of our crew, we were chosen to fly a general officer and his staff on an inspection tour to several locations in Australia and then return. The trip involved flying into a number of places where tankers usually don't go. As we carefully mission planned for the trip, the crew's excitement was obvious. As we pored over the Royal Australian approach plates, we were determined to leave no stone unturned in preparing for this highly visible mission.

The trip started out smoothly, except for having to chase kangaroos off of one runway. The last stop we were to make involved a quick refueling stop at Sidney International Airport before returning to Guam. None of us had ever been to Sidney International before, and we began to run into some of those "circumstances" that I mentioned at the beginning of this article. We flew into Sidney at night with no problems, and carefully taxied our Strato tanker through the maze of taxiways and commercial jetliners. We parked at the Quantas ramp where we were dwarfed by one of their 747's. The refueling, filing, and loading of passengers proved to be very hectic as we worked with the Quantas people who were not used to having stray tankers visit their ramp. We finally found the place to file our flightplan, got our weather, and sifted through about four pages of notams on Sidney International alone. We scrambled back to the aircraft and began our preflight, and as usual in such cases, we were running behind. As we worked our way through the preflight, the AC mentioned that the general, who normally likes to fly when he's on board, would not be making the takeoff as previously planned. The AC also mentioned that I could make the takeoff if I wanted, but at that moment nothing was decided since I was busy doing checklist items and updating our weather. Working quickly, we managed to have everything ready to go as the general and his people arrived at the aircraft. He came up front with us and sat in the jumpseat located between and directly behind us. We carefully taxied out through the maze of taxiways with me running the checklist and trying to follow the airdrome diagram to make sure we didn't make a wrong turn. As we approached the active runway, we were still running behind schedule so we got our takeoff clearance as soon as we could. I completed the final checklist items and the AC briefed that the takeoff would follow the same procedures that we had briefed hundreds of times before (this being the **only** time that we hadn't actually gone through each individual item mentioned in the dash-1). As was his custom, the AC re-briefed the takeoff data as we rolled out onto the active runway. We were cleared for takeoff, and the AC set takeoff power. I then took the throttles and made final adjustments as we rolled down the runway. Normally, the pilot not flying the aircraft guards the throttles, calls out the committed to takeoff speed (S-1), rotate speed, and then moves the gear handle up when safely airborne. On this particular takeoff, we were both guarding the throttles as we rolled down the runway, something that was not really noticed by either of us as we scanned the engine instruments, watched the runway slide under us, and thought about the complex Standard Instrument Departure that we were about to fly. At S-1 speed, we both simultaneously called it over interphone, each not hearing the other. The aircraft started to veer just slightly left of centerline and then the movement stopped and we continued straight down the runway. At the time, I remember thinking to myself that it was unusual for the AC to let the aircraft drift even slightly left of centerline, but the drift was not enough to concern either of us. We continued the takeoff and again we both called rotate over the interphone blocking each other out. The aircraft slowly rotated and began to climb out as both the AC and myself unconsciously added a little back pressure on the yoke as we followed the other one through. Both of us noticed that the climb angle was a little bit shallower than normal. As we climbed out, I waited for the "gear-up call." It seemed to come somewhat later than normal but the AC finally glanced over at me and called crisply, "Gear-up." I understood the call, but I did not understand the puzzled look on his face. The climbout proceeded normally as I went through the checklist items, and the general got up out of the jumpseat and went to the back of the aircraft, apparently satisfied with the fairly smooth takeoff and climbout. After the level-off, when things had settled down a little bit, the AC leaned over to me and half-whispered "weren't you making the takeoff?" It was then and only then that I realized what had happened, and I began to piece together all the small indicators that should have told me what was going on. The AC saw the same things on takeoff that I did. He kicked in a little rudder when he saw me drift left of centerline, pulled back on the yoke a little as he saw me climbing out too shallow, and finally called for the gear as he realized that neither of us was actually flying the aircraft and we were both waiting for the "gear-up" call. All of this took place while three pairs of eyes carefully watched each phase of the takeoff. Although the smoothness with which we backed each other up might be some small tribute to our crew coordination, the larger omission of crew coordination on who was supposed to be making the takeoff nearly caused a disaster!

As we climbed out, I waited for the "gear up call." It seemed to come somewhat later than normal but the AC finally glanced over at me and called crisply, "Gear Up."

In this situation we saw the same old things that can make **anyone** ripe for an accident. The combination of darkness, unfamiliarity with the airfield, lack of time, inadequate takeoff briefing, pressure to get airborne on time, thinking about the SID, and many other factors contributed to what could have been a potential disaster. Fortunately, we were still around to talk about it after the flight, and we have discussed the events of that day many times in retrospect. Just remember, under the right set of circumstances you might become one of "those who have."

THE CUTTING EDGE

Forging The Cutting Edge

Maj Ron Hubbard
Capt Ken Jewett
Capt Dan Borton
4315 CCTS, Vandenberg

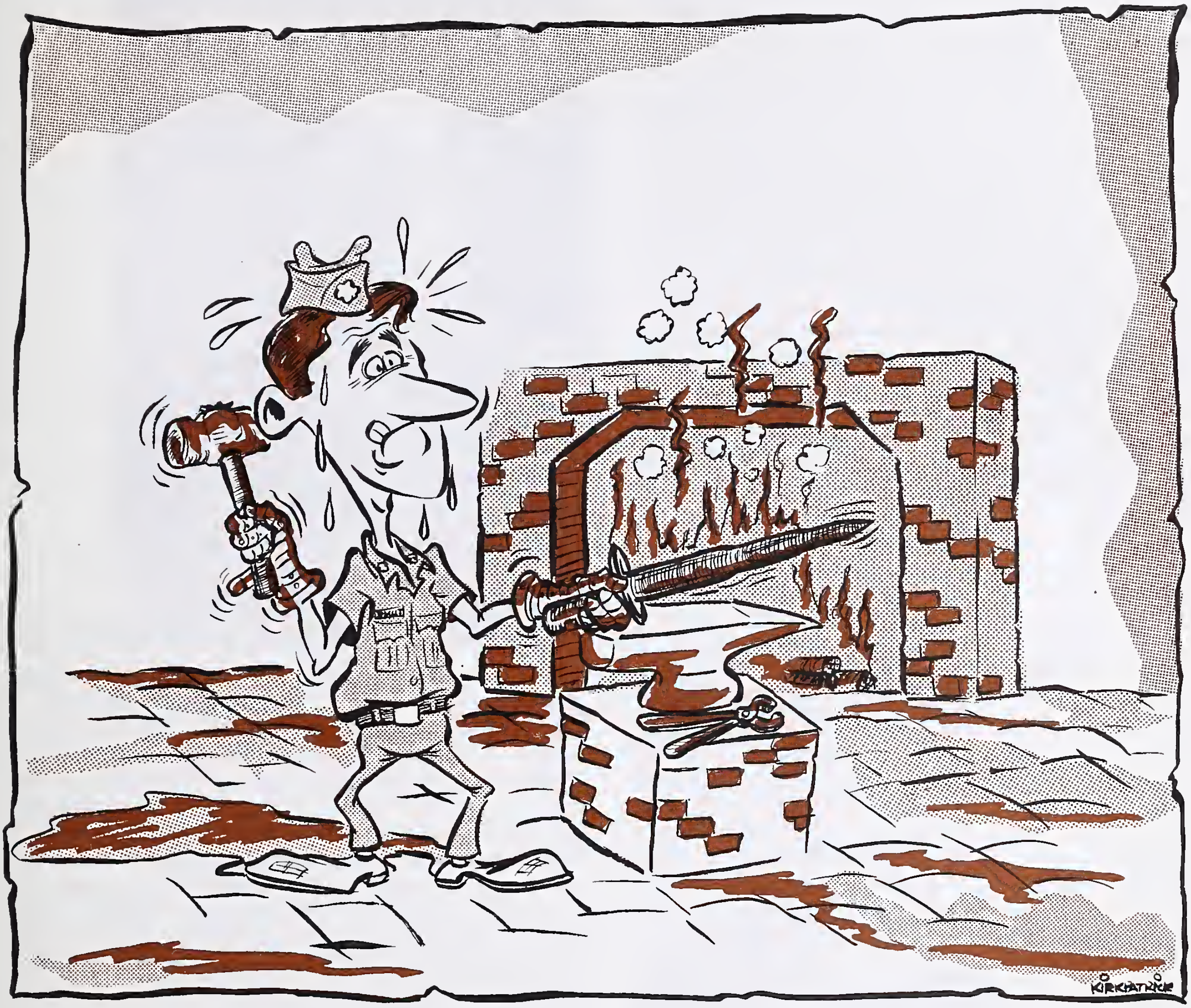
Every SAC missile combat crewmember on alert today, and most missile staff officers, are graduates of at least one of the courses taught by the 4315th CCTS at Vandenberg AFB. While everyone remembers from his student days what the 4315 CCTS does (train and talk missiles), this article will take an inside look at how we conduct this training. We will also review, from a faculty standpoint, the quality control measures taken to insure we send only qualified crewmembers to the missile wings.

Col Chuck Greenley has commanded the 4315 CCTS since June 1981. Besides a distinguished career in aircraft and missile operations, including commanding both a Minuteman and Titan wing, Col Greenley is a well-versed educator. He has had assignments with the Air Force Academy, Squadron Officer School, and the Air Force Reserve Officer Training Corps. In addition to overseeing the normal military organizational functions, he has also infused a strong sense of academe into the squadron, affectionately called "**Missile University.**" This has not gone unnoticed, as the squadron was selected the "**Best Education and Training Unit in SAC**" for 1982.

Functionally, the squadron is organized into three branches: the Management Support Branch, Missile Procedures Trainer Management Branch, and the Missile Training Branch. All of the branches are critical for the successful training of missileers, but for this article we will focus on the Missile Training Branch and its Initial Qualification Training (IQT) program for new missile crew members.

Heading the Missile Training Branch and responsible for all initial crew training is Lt Col George Cody. Lt Col Cody's indepth missile background includes unit level experience in both the Titan and Minuteman Weapon systems, as well as a tour with the 3901st Strategic Missile Evaluation Squadron (SMES). The branch contains Courseware Development, Training Science, and Emergency War Order (EWO) sections as well as one section for each of the five unique weapon system configurations which conduct the IQT program. These sections, and the bases they send graduates to, are: Titan II (Little Rock and McConnell), Minuteman II Command Data Buffer (Grand Forks and Malmstrom), Minuteman Modernized (Ellsworth), Minuteman Modernized Improved Launch Control System (Whiteman and Malmstrom), and Minuteman Modernized Command Data Buffer section (MMM/CDB); however, all the weapon system sections are managed in a similar manner.

At 79 training days (four calendar months), the MMM/CDB IQT program is the longest course taught at the school. The program consists of 13 EWO days, 29 weapon system academic days and 25 Missile Procedures Trainer (MPT) sessions. Processing, evaluations and collateral training round out the course. Students begin the course, following processing into the squad-



ron, by receiving briefings on their professional responsibilities and the duties they have been chosen to perform, known locally as PREPS. After being exposed to their role as keepers of our nation's peace, they sign a personal commitment statement. This statement will be indorsed later in the course after they have performed their first simulated EWO launch.

Beginning with day one, the students undergo continuous evaluation on their abilities to perform the functions taught in either an academic environment or in the MPT. These evaluations take the form of academic or EWO tests on the day following each lecture and by a performance rating on each of their MPT sessions. The staff continuously monitors a student's performance for any downward trends or unsatisfactory progress.

Students have the least trouble with academic testing. Most are just out of college, either from AFROTC or the Air Force Academy, and are familiar with the studying and testing environment. The tests are multiple choice and average 10 questions in length, with the comprehensive final being 50 questions. EWO tests are more difficult, being situational in format. Most students have not been exposed to this type of test, requiring the carrying over of information from one question to the next within the situation.

It is in the MPT where our students have the most difficulty. Here, unlike the classroom environment, they must work with another student and actually perform the tasks they have learned. Also, when status is presented in the MPT it requires a student to evaluate indications, select solutions and respond in a timely manner; on a test, all material is spelled out and the

Cont'd on page 26

Aircraft Maintenance

SSgt Debbie N. Fair, 22 AREFW, March AFB, is SAC Maintenance Airman of the Month. SSgt Fair, a Jet Engine Technician, is assigned as Shift Supervisor in the Engine Conditioning Shop where she has worked vigorously to achieve perfection in all areas of responsibility. SSgt Fair was on board when the first KC-10 arrived at March AFB. Faced with a new and exciting challenge, she recognized the need for training and the limiting factors associated with a new weapons system. SSgt Fair, a junior supervisor, initiated a training program that would systematically allow the proficiency progression of all jet engine technicians to reach the highest level in minimum time. She not only developed a rigid one-on-one training session for subordinates but also was instrumental in increasing the technical expertise of some of her supervisors. This foresight and dedication proved invaluable when shortly after the entrenchment of the new aircraft a major TCTO arrived in the field that required the removal of eight engines. SSgt Fair was chosen as the crew chief responsible for this major undertaking. During this operation, which was completed in just one month, SSgt Fair became the first engine technician to change a KC-10 tail engine at the 22 AREFW.

Missile Maintenance

SSgt John E. Ridout, 394th ICBM, Test Maintenance Squadron (TMS), Missile Handling Unit, Vandenberg AFB, is SAC ICBM Airman of the Month. SSgt Ridout exhibits great pride in performing quality maintenance and instills this pride throughout the organization. He has earned an impressive total of 20 highly qualified and 14 qualified evaluation grades. As a result of his dedication, professionalism, and superior knowledge of the Minuteman weapon system, he has been awarded two consecutive Exceptional Maintenance Evaluation Performance certificates from Quality Control. His thorough inspections and timely documentation of shop equipment and vehicles contributed directly to the excellent rating the squadron received for its hardware maintenance program during the recent 3901st SMES inspection visit and the excellent rating earned during the SAC IG's visit. SSgt Ridout's demonstrated ability and performance are unsurpassed. He is a dedicated NCO and a valuable asset to the SAC ICBM maintenance effort and the Air Force.

PROFESSIONAL PERFORMERS

Thomas S. Power Award

MSgt Harold R. Collum, 97th BMW, Blytheville AFB, is the winner of the General Thomas S. Power Award for 1983. This award recognizes SAC's Aircraft Maintenance Airman of the Year and is the highest individual aircraft maintenance award conferred by SAC.

As NCOIC of the Equipment Maintenance Branch, Sgt Collum's personal 100 percent inspection of all maintenance accomplished on assigned nuclear support and handling equipment assures that it performs better than that of any other equipment maintenance branch in the command. During SAC BUY NONE and again during a recent SAC ORI, all assigned equipment operated flawlessly. Sgt Collum developed and implemented a comprehensive and aggressive training program to greatly upgrade the experience level of all branch personnel. This program, coupled with his management and inspection techniques, resulted in consistently superior performance on higher headquarters inspections. During his assignment, his branch has received four evaluations from the SAC IG. The first two were rated excellent with the two most recent being rated outstanding. Among the numerous procedures and programs SGT Collum has implemented is his revision of 30 day inspection procedures to weekly intervals. With only one trip per week to the Weapons Storage Area to accomplish requirements, where two or three were previously required, the time saved provides greater flexibility and efficiency. Sgt Collum also implemented a specialized crew concept for each type munitions trailer maintained. This has greatly increased maintenance capability, productivity and quality of work.

Flying Crew

On 15 Feb 84, Capt Moore, aircraft commander, and Major McClellan, radar navigator, were returning an FB-111 to Pease AFB, New Hampshire from Plattsburgh AFB, New York. This ferry flight resulted from an off station return to Pease which was diverted to Plattsburgh because of low visibility from sea fog.

The weather at Pease cleared to (300-1) and the crew was directed to launch. Pre-takeoff checks were accomplished and all systems checked good. After leveling off at 10,000 feet for a 25 min flight direct to the IAF at Pease, the pitch/roll autopilot was engaged. Approximately three minutes after engaging the autopilot the aircraft experienced a three "G" uncommanded pitch up. The bold face for uncommanded pitch was accomplished, the autopilot disengaged, and aircraft control restored. At this point the navigator attempted to contact the Pease Command Post and advise them of the pitch up. When it became apparent the number one radio had failed, they switched to the number two radio and contacted the command post.

Upon configuring the aircraft for the approach, the main landing gear light indicated unsafe; there was a red light in the gear handle, aural tone and an unusually heavy airframe buffet. Once again the crew contacted the command post to advise them of the situation and briefed them they had completed the gear malfunction checklist. An ILS low approach was flown and a visual check indicated the main gear down and the speed brake fully extended. (In the FB-111, the fully extended speed brake hangs below the main gear.) Because of the unusual cockpit indications and conflicting visual check, interpretation of checklist steps was vague. General Dynamics was then called for clarification and another ILS low approach visual check was accomplished to confirm the result of the first. After the second approach the crew was cleared to a holding pattern to await instruction from the command post. It was now totally dark, the weather had deteriorated to an obscured ceiling — ½ mile visibility, rain, fog — a decision had to be reached soon. It was decided to leave the gear handle down and alternately extend the gear with pneumatic pressure, a slight checklist deviation. Once this was done, the speed brake went to the required trail position but the main gear still remained unsafe. Another ILS low approach to minimums was accomplished and the visual check showed the gear to be down and the speed brake to trail. Because the main gear indicated unsafe, another ILS low approach to minimums was accomplished. The visual check confirmed the gear to be down and the speed brake to trail. Although the main gear indicated unsafe, the experts were convinced due to the single trunnion axis of the main gear, that they were indeed down and locked. A fourth ILS to minimums and an uneventful landing ensued.

Maintenance determined that the uncommanded pitch up was due to a faulty pitch function in the yaw computer and the gear problem was caused by two totally independent squat switch malfunctions.

Cont'd from page 11

"Everybody's OKAY!" (Thank God! — **He** sure was with us today.)

The final tally on the "mishap" was one engine, two tires and eight brakes. The student navigator suffered minor burns on both hands when he slid down the escape rope, because he wasn't wearing gloves. The initial cause was a gear failure that resulted in explosion of the number two generator constant speed drive (CSD). The fire started with the oil from the CSD. The experts felt that because the generator shaft did not shear, there was enough vibration to cause the oil pressure accessory housing (OPAH) to shift off its mounts. This drained all the engine oil into the cowling area, and severed the hydraulic supply line from the reservoir to the hydraulic pump, dumping the entire left hydraulic system quantity into the cowling area in less than one minute. This added fuel to an already very hot fire.

The bottom line or lesson learned from this incident is simple — be prepared. I know it sounds like something you learned in scouts, but it's much more than just a slogan. It's a life-preserving attitude that must be instilled in every crewmember. To cultivate this idea of being prepared, three areas — study, planning and practice — require concentrated attention.

Study is primary. You must have the knowledge before you can benefit from either of the other areas. Each of us had a relatively sound knowledge of aircraft systems and emergency procedures when we completed Combat Crew Training School, but we quickly became rusty and systems became hazy. So when you study, don't just study to pass Stan Eval tests or checkrides. Study the Dash-1 and other regulations with the attitude that the more you know about your aircraft and how to fly it, the greater the chances that you and your crew will react correctly in those life threatening situations.

The next step is to use that knowledge to develop a plan. Take time during mission planning, or some other convenient time, to get your crew together and play "what if" or hangar fly emergency situations. Make sure each crewmember knows what to do and what is expected of him. For example: aircraft evacuation — how are you going to exit the aircraft, in what di-

---

SAC'S FLYING SAFETY RECORD

CLASS A FLIGHT MISHAPS

YEAR	74	75	76	77	78	79	80	81	82	83	84
TOTAL MISHAPS	8	4	4	4	1	5	4	4	2	2	0
FLYING HOURS 100,000	5.1	4.2	3.9	3.7	3.6	3.6	3.4	3.5	3.5	3.0	0.8
FATALITIES	14	7	22	10	5	7	2	14	9	7	0
RATE	1.6	1.0	1.0	1.1	.28	1.4	1.2	1.2	.58	.65	0.0*

* ESTIMATED RATE BASED ON 310,000 FLYING HOURS

	8AF	15AF
4		
2		
0		

1984 CLASS A MISHAPS	

CLASS B	
MAR	0
1984	1

CLASS C	
MAR	38
1984	83

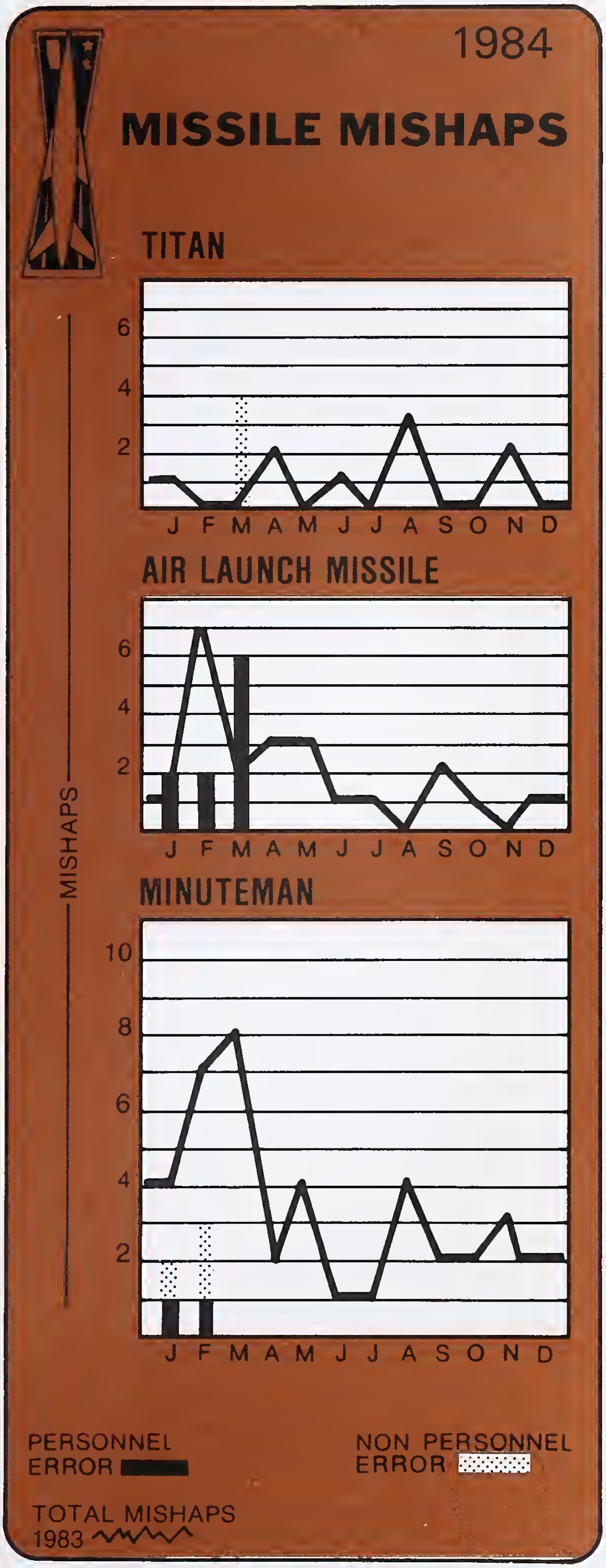
FLYING HOURS	
FEB	29,352
1984	83,402

rection, etc? Plan where to fly for terrain avoidance, fuel dumping. Who's going to talk on what radio and when? Cover every situation you can think of. Discuss emergencies you have read or heard about and consider what you would have done.

Finally, you have to put the knowledge and the plan into practice. This is not limited to the much maligned simulators, nor just the pilots. Practice in the aircraft. After a mission and the engines are shut down, simulate a problem and run through an evacuation. Hangar fly emergencies in the parked aircraft. Become familiar with emergency equipment and its location in the aircraft. Learn what the other crew positions do during emergencies. When the pilots go to the simulator, take the other crew members along. Allow them to see what different malfunctions look like and what the pilots are doing during emergencies. Discuss what those other crew members might do to help out. Familiarity, in this case, does not breed contempt, but enhances crew coordination and ultimately survival.

Additionally, pilots — take simulators seriously. Take advantage of every allotted minute. Try to divorce yourself from the fact that you're in "the box" and "psych" yourself into being in the airplane. Believe me, there is a big difference in your mental attitude between a real emergency and going through the motions in the simulator. Lastly, it is not unrealistic to have multiple emergencies. Often one problem leads to or causes another. Also, emergencies do not follow the same routine every time. Each emergency has its own variation or quirk because the circumstances are never identical — there are just too many variables. So be inventive, be original — make your simulators a learning experience that will be remembered when the "real thing" happens.

If you don't remember anything else from this article, remember this — your life, and the lives of others, may depend on your knowledge, the knowledge of the crew members you fly with and your ability to apply that knowledge. There is only one way to insure that you have that necessary knowledge and proper application, that's — **be prepared.**



Cont'd from page 21

correct answer is always available. In addition, he must also assess priorities among the given situations, something he need not do on a test. All the while, two instructors are present to ensure the student reacts correctly. One of these instructors will follow the student throughout the training program while the other primarily ensures the MPT is functioning properly and the script is correctly presented.

Should an instructor detect a drop in performance in any given phase of the course, he immediately informs the student and attempts to determine and correct the cause. If this action proves ineffective, the instructor will notify the Senior Instructor or Section Chief and recommend placing the student in the Quality Enhancement Program (QEP). This program identifies and resolves substandard student performance. Remedial training normally consists of counseling, one-on-one training, and additional training sessions on weekends. If their problems are in the classroom, they will report to the appropriate study hall, academic or EWO, for a special lesson plan designed to meet their particular needs. If the MPT is where they are experiencing problems, they have priority for additional MPT time. This usually consists of one-on-one training with their instructor in areas giving them the most difficulty. The instructor will also brief the student on how he is progressing, things he can do to improve, and to pass along any suggestions the senior staff may have. The Section Chiefs brief the Squadron Commander on the student's performance weekly. This briefing allows him to closely monitor a student's progress and to discuss various ways of helping the student improve performance.

If the student's performance does not improve or it continues to decline, the unit will convene a Student Progress Review Panel (SPRP) to evaluate the student's situation and formulate recommendations. The panel consists of our instructors not associated with the individual student's training. They interview all the instructors who have given the student training and the student himself. At the conclusion, the panel presents their recommendations to the Section Chief for his approval. Usually, this results in a continuation in training until an established review date or a recommendation for a Faculty Board. If a Faculty Board is recommended, the recommendation is immediately forwarded through the Training Branch to the Squadron Commander.

If a student fails to show improvement by his review date, the Section Chief will recommend to the Commander, through the Training Branch Chief, the student meet a faculty Board for possible elimination from training. Usually by this time the student has received over 100 additional training hours. Every effort is made before this point to bring a student's performance up to SAC standards. In fact, most students placed on the program successfully complete the course and go on to be good Missile Combat Crew Members.

The final test of a student's ability to become a missile launch officer, and a requirement for graduation, is an evaluation by the 3901 SMES. Historically, 85 percent of the students initially pass this full six hour comprehensive MPT evaluation. If a student does not pass the first evaluation, the Section Chief usually affords him a second chance but may convene a SPRP to accomplish a thorough review of the student's training program and present recommendations for a recheck. Should he fail another time, a Special Student Progress Review Panel (SSPRP) reviews the student's performance and considers whether to afford the student another opportunity or to recommend Faculty Board action. This panel is much the same as a SPRP except for the composition of the board. Here, the Training Branch Chief, Section Chief of the applicable weapon system, and Chief of Training Sciences are the key board members. In addition to the student's instructors, the 3901 SMES evaluators will be called as witnesses as well. Any time a student is given a recheck, he is restrained as a minimum on the areas he had difficulty with on the initial evaluation. Successful completion of all phases of IQT (academics, EWO, and MPT) and passing the 3901 SMES evaluation results in the student being declared mission ready and receiving the hard-earned missile badge.

We would like to emphasize quality control is a primary concern in this education oriented squadron. During the last year, the squadron eliminated from IQT nine percent of all Minuteman entrants for either academic, Personnel Reliability Program, security, or medical reasons. (Titan students receive 10 weeks of training and screening at Sheppard AFB before reporting to IQT). The staff and faculty at the 4315 CCTS are all enthusiastic, career minded missileers. They are devoted to fulfilling their informal contract with the missile Wing Commanders of only graduating students who meet the technical and professional standards of a SAC Missile Combat Crew Member.

A "selectively manned" unit, all 4315 CCTS instructors are hand-picked volunteers who have been approved by the Squadron Commander and HQ SAC. If you are, or have recently been, a missile crew member with instructor or evaluator experience, you may be eligible to become part of this one-of-a-kind unit. If you think you can contribute to training future missileers, consider an assignment with the 4315 CCTS. For information on how to apply for a position, contact the Missile Training Branch at Autovon 276-9942. It's a unique organization with a demanding mission and unlimited rewards.

Safety Screen

The SAC Safety Screen is an honor roll of SAC's most professional crews. To gain listing on the Screen, crew members must be nominated by their unit commanders and meet high selection criteria of experience in their aircraft or missile system *IAW AFR 127-2/SS1.*

325 BMS, Fairchild Crew E-22: MP Capt Leslie E Bullock, MC Capt Larry H Haskell, MR Capt Thomas L Sorrell, MN Capt Kent I Shepherd, ME 1Lt Blain W Secor, MG SSgt Mark S Parton

43 AREFS, Fairchild Crew S-130: Maj Peter J Baum, Capt Gary M Ullrich, 2Lt Antoine M Garton, SSgt Phillip B Montgomery

43 AREFS, Fairchild Crew R-113: Capt Samuel L Grier, 1Lt Steve Z Pasinsky, Capt Gary S Neilsen, SSgt Marleen K McGuire

92 AREFS, Fairchild Crew E-163: Capt Carl E Blomstrom, 1Lt Robin D Pang, 1Lt Michael J Scheall, A1C Jayson D Lively

92 AREFS, Fairchild Crew R-171: Capt David J Rader, 1Lt Michael J Cooper, 2Lt Kenneth L Smith, TSgt Ronald L Whitmire

931 AREFG, Grissom Crew: P Capt John C Dibbern, CP 1Lt Rebecca S Hinnant, N Capt John M Salmon, BO TSgt Kim E Esbenshade

24 SRS, Eielson Crew S-01: IP Maj John R Hickson, CP Capt Russell D Glover, N-1 Capt Steven R Nielsen, N-2 Capt David A Patterson

24 SRS, Eielson Crew S-11: TC Capt Richard N Hansen, R-1 Capt Randy D Roberts, R-2 1Lt Brian C Bergdahl, R-4 Capt Russell L Tatro, MT Capt James R Martin, PT SSgt Steve S Wiseman, ET TSgt William W Bruens

22 AREFW, March Crew R-142: FP Capt Bruce R Reed, CP Capt Robert K Millmann Jr, NN 1Lt Frances K Popper, IB SSgt Robert L Durbin

22 AREFS, March Crew R-141: FP Capt Donald R Cavin, CP 1Lt Mary B Schmanski, IN Capt James S Bair III, IB SSgt William E Wright

62 BMS, Barksdale Crew R-13: P Maj James D Teigen, CP Capt Harry B McCarraher, CP 1Lt Steven M Lynn, RN 1Lt Charles Simpson, N 1Lt Timothy D Herfel, EW 1Lt Christopher D Dubois, G SSgt Dana R Blalock

596 BMS, Barksdale Crew S-51: P Maj Lester A Sliter, CP Capt Raymond K Schnabel, RN Capt Richard E Lumpkin, N 1Lt Randall M Walls, EW Capt Robby W Morris, G MSgt James E Howell

596 BMS, Barksdale Crew S-62: P Capt Robert E Sears, CP 1Lt Steve J Norris, N Capt Rafael Frontaura, N 1Lt Michael G Diggs, EW 1Lt Steven A Deloach, G SSgt Alan W Turney

71 AREFS, Barksdale Crew E-112: P Capt Gregory J Peterson, CP 1Lt Gregg A Frank, N 1Lt Edison A Beane Jr, BO SSgt Kenneth P Fabiny

71 AREFS, Barksdale Crew R-26: P Capt Timothy W Hurst, CP 1Lt Raphael J Laporte, N Capt Steven J Hill, BO TSgt Melvin M Hitchcock

32 AREFS, Barksdale Crew: P Capt Ryan S Dow, CP Capt Kenneth VanTreuren, FE SSgt L Gene Bouler, BO SSgt Robert A Downs

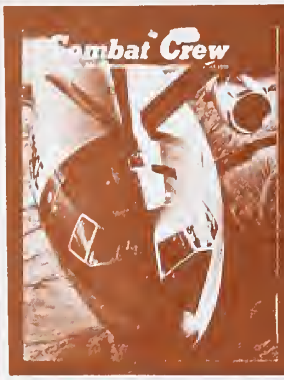
7 AREFS, Carswell Crew R-121: P Capt Douglas Livenois, CP Capt Douglas F Bonten, P 2Lt Donald Altman, BO TSgt Rudolph C Spence

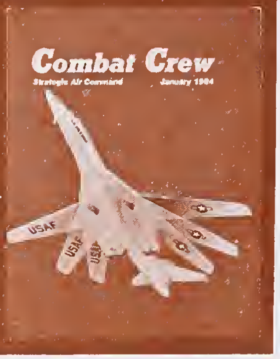
9 BMS, Carswell Crew R-82: P Maj Stephen D Harrison, CP 1Lt Jefferey W Ray, IRN Capt David E Whipkey, IN 1Lt David L Kelly, EW 1Lt John M Reidy, CP SSgt Stephen A Ray

20 BMS, Carswell Crew E-14: P Capt John G Prunty, CP Capt Terry M Birdwell, RN Capt John W Klise, P 1Lt James Doss, IEW Capt John E Alexander, G SSgt James A Meek

FLARE

UNIVERSITY OF FLORIDA
3 1262 09683 6092





Combat Crew

celebrates its

34th birthday!